

The Office of Environment, Safety and Health and its Office of Nuclear and Facility Safety (NFS) publishes the Operating Experience Weekly Summary to promote safety throughout the Department of Energy (DOE) complex by encouraging feedback of operating experience and encouraging the exchange of information among DOE nuclear facilities.

The Weekly Summary should be processed as an external source of lessons-learned information as described in DOE-STD-7501-96, *Development of DOE Lessons Learned Programs*.

To issue the Weekly Summary in a timely manner, the Office of Operating Experience Analysis and Feedback (OEAF) relies on preliminary information such as daily operations reports, notification reports, and, time permitting, conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the summary, please bring this to the attention of Jim Snell, 301-903-4094, or Internet address jim.snell@hq.doe.gov, so we may issue a correction.

Readers are cautioned that review of the Weekly Summary should not be a substitute for a thorough review of the interim and final occurrence reports.

Operating Experience Weekly Summary 97-16

April 11 through April 17, 1997

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EVENTS

1. LIMITING CONDITION FOR OPERATION NOT ENTERED BECAUSE OF INCORRECT EQUIPMENT STATUS

On April 10, 1997, at the Savannah River Material Test Facility, a supervisor allowed mechanics to remove a signal cable from an operational air monitor without declaring it inoperable and entering the applicable limiting condition for operation. The mechanics suggested swapping the signal cables with the operable monitor to help troubleshoot electronics in a second air monitor that was already inoperable and in a limiting condition for operation. The supervisor agreed to the suggestion because he knew no work was being performed in the affected hoods. The supervisor notified the radiological control operations supervisor and operations shift manager. Neither of them recognized the need to declare the first air monitor inoperable. As a consequence, the facility did not enter the applicable limiting condition for operation for the first air monitor. Failure to initiate the required action steps of a limiting condition can place the facility in an unanalyzed condition and decrease the margin of safety. (ORPS Report SR--WSRC-TRIT-1997-0006)

Personnel on the next shift determined that a post-maintenance test had not been performed following removal and reconnection of the air monitor signal cable. They declared the air monitor inoperable and entered the limiting condition for operation. Mechanics performed a successful post-maintenance test on the monitor. Operators declared the monitor operable and exited the limiting condition for operation.

The successful performance of the post-maintenance test verified that the air monitor was effectively functional from the time the signal cable was reconnected. This, coupled with the supervisor's verification that no work had been performed in the hood during the 3 minutes of inoperability, ensured that the actions required by the limiting condition for operation were met. However, the improper status of the equipment could have led to a failure to meet the conditions of the limiting condition for operation. Investigators believe the supervisor forgot that removing the signal cable would render the air monitor technically inoperable.

Operating Experience Analysis and Feedback engineers also reviewed a related event at the Rocky Flats Environmental Technology Site. On April 10, 1997, a building shift manager failed to terminate operations as required by the operational safety requirements when the building experienced differential pressure problems. The operational safety requirement for the building requires differential pressure controllers to be functioning correctly (operable). The shift manager should have terminated operations because the controllers were functionally inoperable in controlling differential pressure. (ORPS Report RFO--KHLL-374OPS-1997-0001)

NFS reported equipment operability issues in Weekly Summaries 96-49, 96-41, 96-39, 96-36, 96-32, 96-29, and 96-28. Weekly Summary 96-36 reported a limiting condition for operation violation at the Savannah River Site, where operators failed to track time limits to complete a fan repair. Corrective actions included improvements to the equipment status controls and to the shift turnover equipment data transfer process. (ORPS Report SR--WSRC-HBLINE-1996-0017)

This event illustrates the need for supervisors to control the status of equipment and clearly understand the requirements for equipment and system operability as required by operational or technical safety requirements. Also, operational testing must be performed following maintenance to demonstrate that equipment and systems are capable of performing their intended function. DOE Order 5480.22, *Technical Safety Requirements*, provides guidance regarding limiting condition for operation compliance and discusses the term "operability" as it relates to supporting compliance with limiting conditions for operation. Managers, supervisors, and operators should review the Order to ensure common understanding and application of operability requirements. DOE 5480.19, *Conduct of Operations Requirements For DOE Facilities*, chapter VIII, "Control of Equipment and System Status," specifies that shift supervisors must be aware of equipment status. DOE-STD 1039-93, *Guide to Good Practices for Control of Equipment and Status*, section 4.4, "Operational Limits Compliance," recommends establishing and enforcing administrative controls to ensure supervisors are aware of compliance with operational limits. DOE-STD 1041-93, *Guide to Good Practices for Shift Routines and Operating Practices*, section 4.1.2, provides guidance on the network to be established and reviews necessary to ensure equipment status is understood by shift supervisors.

KEYWORDS: equipment operability, limiting conditions for operations, post-maintenance testing

FUNCTIONAL AREAS: operations, electrical maintenance

2. SAFETY DEFICIENCIES RESULT IN CONSTRUCTION PROJECT STAND-DOWN

On April 2, 1997, procurement managers at the Los Alamos National Laboratory notified a construction subcontractor to officially stand-down operations at the Dual Axis Radiographic Hydrotest Facility. The subcontractor was building structures that will house equipment designed to ensure reliability and safety of existing nuclear weapons without nuclear testing. The stand-down resulted from numerous safety deficiencies identified in a subcontractor employee formal complaint to the Department of Energy/Albuquerque Operations Office. Deficiencies included unstably stacked aluminum walkways that could collapse on employees, exposed rebars that were not capped to prevent employees from being impaled, and two ladders that were spliced together using two-by-fours. Inspectors considered these safety deficiencies to be serious, with the potential for serious physical harm or even death. (ORPS Report ALO-LA-LANL-ADOADMIN-1997-0001)

On March 31, 1997, an ex-employee of the construction subcontractor notified the DOE/Albuquerque Operations Office of unsafe working conditions. DOE/Albuquerque Operations personnel performed an assessment of the alleged unsafe work environment. Inspectors conducted two OSHA-type inspections of the construction site on April 1 and April 3, 1997. Based on these inspections, additional deficiencies were identified. The following are examples of these deficiencies.

- Fall protection guard rails were inadequate.
- A safety latch spring on a mobile crane hook was inadequate and wire rope slings used for lifting were "bird-caged" (i.e., the outer strands of the wire rope form a cage when the rope is forced into compression).
- A fire extinguisher was blocked by conduit and rebar.
- Bottles, wire, exposed nails, and insulating tarps scattered throughout the area created trip and impalement hazards.
- Labels on gasoline and diesel fuel containers were insufficient and materials were used on site that were not in the material safety data sheet inventory.
- Training for use of ladders, scaffolding, excavation, personal protective equipment, fall protection, and hazardous materials was inadequate.

On April 9, 1997, the senior construction manager for the subcontractor submitted a written response to the Laboratory findings stating that all the physical deficiencies had been corrected. The subcontractor's corrective action plan included (1) providing a dedicated safety manager on site, (2) conducting daily safety briefings before starting work, (3) providing trending and tracking data, (4) assigning craftsmen to inspect and repair safety controls, (5) posting names and phone numbers for reporting safety/quality deficiencies, and (6) improving the worker training program. Based on a review of the corrected deficiencies and the corrective action plan, Laboratory procurement managers lifted the stand-down on April 14, 1997. The stand-down was only an interim measure; if safety problems continue to exist, they will suspend work.

Investigators are reviewing inspection logs to determine whether the Laboratory's level of safety oversight was a cause of this event. On April 7, 1997, the Laboratory added a full-time safety oversight person to the project. This person will prepare reports on safety findings and trend data by category, contractor/subcontractor, and degree of severity.

NFS reported work stand-downs for safety deficiencies or violations in Weekly Summaries 97-03, 96-47, 96-33, 96-31, 96-29, and 96-12. Weekly Summary 96-47 reported that on November 14, 1996, at the Savannah River Site facility managers at Central Services Works Engineering issued a stand-down order to a subcontractor following two events involving safety procedure violations. The order prohibited the subcontractor from performing any work on site until its personnel were retrained on the site safety manual. (ORPS Report SR--WSRC-CSWE-1996-0010)

Construction safety is extremely important. The Bureau of Labor Statistics data for construction-related occupational injuries shows that there were 1,300 fatalities and 300,000 disabling injuries in 1992. The total recordable case rate for 1995 was 10.6 cases per 200,000 manhours.

This event illustrates the need for Management and Integrating contractors to closely supervise subcontractors that perform construction and maintenance work at DOE facilities. Management and Integrating contractors should provide safety oversight of subcontractor administrative controls, safety programs, and work plans to ensure subcontractor personnel perform work safely and in a safe working environment. Management and Integrating contractors should also review DOE 4330.4B, *Maintenance Management Program*, chapter II, section 8.3.6, "Control of Non-Facility Contractor and

Subcontractor Personnel," which states that non-facility contractor and subcontractor managers should be held accountable for the work performed by their personnel. They should also review the OSHA safety requirements of 29 CFR 1926, *Safety and Health Regulations for Construction*, which provides information on general safety and health in subpart C and occupational health and environmental controls in sub-part D.

KEYWORDS: personnel safety, construction, contractor controls

FUNCTIONAL AREAS: construction, industrial safety

3. PREVENTIVE MAINTENANCE PROGRAM DEFICIENCIES

On March 25, 1997, at the Fernald Environmental Management Project, two Department of Energy auditors discovered numerous deficiencies in the site preventive maintenance program during a conduct-of-operations maintenance assessment. The findings prompted the prime contractor to conduct a site-wide inspection of preventive maintenance components. The prime contractor found that approximately 400 pieces of equipment had exceeded the date for their scheduled preventive maintenance. The equipment included vehicles, tools, hydraulic jacks, rigging equipment, and portable eye wash stations. Failure to perform preventive maintenance can result in premature equipment failure. (ORPS Report OH-FN-FDF-FEMP-1997-0027)

The auditors became aware of deficiencies when they found two hoists with expired preventive maintenance tags. They investigated the preventive maintenance database and found that 374 pieces of hoisting and rigging equipment had expired dates. Investigators could locate only 87 of the 374 pieces of equipment. They believe that the missing pieces were probably categorized as waste during decommissioning, and the information was never recorded in the preventive maintenance database.

Investigators determined that operating procedures require all personnel to check the tags on equipment before use. The procedures also require employees to perform preventive maintenance or notify the responsible organization when they find out-of-date tags. The procedures do not require employees to tag out or disable equipment with expired tags.

On April 3-5 1997, Fernald management directed all site personnel to inspect equipment in their work areas for out-of-date preventive maintenance tags. The results of this review prompted the prime contractor to conduct a site-wide inspection of all items requiring preventive maintenance. Because of the many deficiencies discovered during this inspection, Fernald management held a fact-finding meeting on April 8 with prime contractor and DOE personnel. The contractor is continuing to investigate to determine causes and corrective actions.

An example of the consequences of inadequate preventive maintenance is an incinerator fire at a uranium fuel fabrication plant in Erwin, Tennessee, on April 2, 1997. The operator of the plant was a Nuclear Regulatory Commission licensee. Commission personnel investigated the fire and proposed a \$12,500 civil penalty against the licensee for violation of operating requirements. The violations included (1) failure to institute adequate procedures and multiple failures to follow procedures and (2) failure to implement a preventive maintenance and surveillance program for the incinerator and components essential to safety. (OEWS 96-36, 96-16 and 96-14)

This event highlights the importance of an effective preventive maintenance program and procedure adherence. Essential to the program is a preventive maintenance tracking system that ensures changes to equipment inventories are programatically and correctly reflected in tracking and scheduling systems. This includes ensuring that work requests, work packages, and decommissioning documentation contain provisions to update the systems. The reliability of equipment and components cannot be assured unless preventive maintenance is effective and timely. DOE 4330.4B, *Maintenance Management Program*, section 7.3.2.b, "Work Priority," identifies the need to set priorities for maintenance based on the importance of the component or system. Examples of work requests that give personnel and radiological safety the highest priority are also included. Chapter II, section 5, of the Order states: "A proper balance of corrective and preventive maintenance should be employed to provide a high degree of confidence that facility equipment degradation is identified and corrected, that equipment life is optimized, and that the maintenance program is cost effective."

KEYWORDS: preventive maintenance, procedure, audit

FUNCTIONAL AREAS: electrical maintenance, mechanical maintenance

4. FIVE WORKERS CONTAMINATED AT MOUND

On April 8, 1997, at the Mound plant, workers contaminated their gloves and boots while taking core samples from an asphalt paved area with known sub-surface contamination. The workers were not wearing anti-contamination clothing. Radiological control technicians discovered the contamination on five of seven workers leaving the area. Technicians discovered alpha contamination (plutonium-238) on the boots of five workers and the gloves of two workers. Contamination on the boots ranged from 325 to 4,200 dpm. The glove readings were 450 dpm and 350 dpm. There is no indication that there was any personnel uptake. Failure to properly plan for potential contact with contaminated soil resulted in unnecessary contamination. (ORPS Report OH-MB-EGGM-EGGMAT04-1997-0003)

Several years ago, workers at Mound created the paved asphalt area to fix and shield against the contamination from an outdoor spill of plutonium-238. On April 8, in preparation for site remediation, workers were using an auger to take core samples beneath the paved area in 14 locations. Technicians were using the samples to help assess the magnitude and extent of the contamination. Planners assigned radiological control technicians to monitor the work, but did not specify use of anti-contamination clothing in the soil-sampling radiological work permit.

When the workers excavated the sixth core boring, the technician detected 8,000 dpm/100cm² removable alpha on the auger. The technician stopped the work and had the workers wet down the auger and place a tarp over the area to minimize the spread of contamination. Work was immediately stopped after the site was brought into a safe stop-work condition. Technicians discovered the personal contamination when they frisked the workers after the contamination was discovered on the auger.

Technicians successfully decontaminated the workers' boots and gloves and posted the area as a "High Contamination Area." A new job-specific radiological work permit requiring personal protective clothing was issued on April 9, 1997. Managers conducted a critique of the event. Radiological Operations personnel stated that they need to evaluate the radiological controls necessary for excavating in areas that are not identified as

"contamination areas" but are known to contain sub-surface contamination at elevated radioactivity levels.

Operating Experience Analysis and Feedback (OEAF) searched the Occurrence Reporting and Processing System (ORPS) database for reports of personal contamination events and found 2,853 occurrences DOE-wide. Figure 4-1 shows the breakdown of these events by root cause. Facility managers most often reported management problems as the root cause, and this category accounts for 43 percent of the events. Further review shows that 14 percent of management problems were reported as work organization planning deficiency.

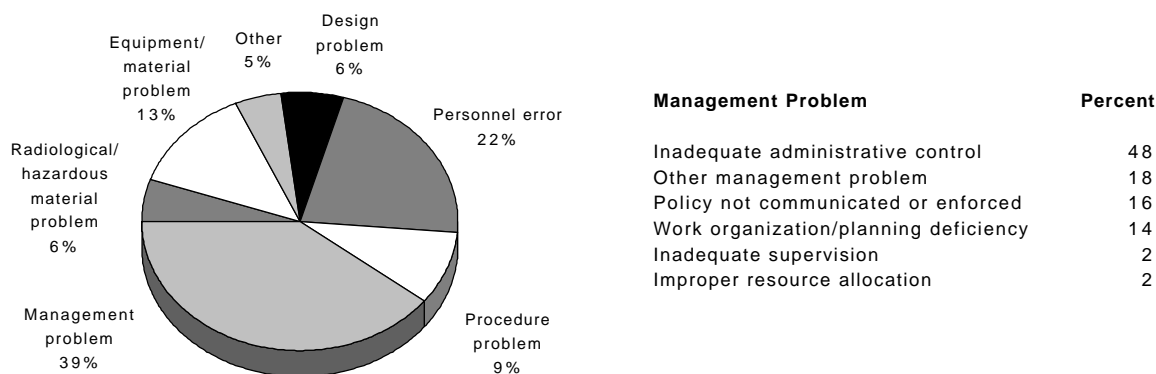


Figure 4-1. Root Causes of Personnel Contamination Events¹

This event illustrates the importance of planning for possible radiological contamination when developing work packages and radiological work permits. Guidance on worker protection during decontamination and decommissioning activities can be found in DOE/EM-0142P, *Decommissioning Handbook*, March 1994, DOE Office of Environmental Restoration. Section 12 of the handbook states that extra precautions are required for worker safety because hazards in the facility may be unknown and many activities are infrequently performed. DOE/EH-0256T, *Radiological Control Manual*, provides guidance on planning and performing radiological work. The radiological work permit is an administrative mechanism used to establish radiological controls for work activities. The responsibility for ensuring adequate planning and control of work activities resides with line management. Managers should ensure that work control processes are followed and all possible contamination mechanisms are evaluated.

KEYWORDS: radioactive contamination, radiological work permit, alpha

FUNCTIONAL AREAS: radiation protection, work planning

¹ OEAF engineers reviewed the ORPS database for Nature of Occurrence "4B" (Personnel Contamination) and found 2,627 reports containing 2,853 occurrences.

OEAF FOLLOWUP ACTIVITY

1. CLARIFICATION OF WEEKLY SUMMARY 97-14, ARTICLE 3, ENGINEER SHOCKED BY CHARGED CAPACITOR

Several readers of the Operating Experience Weekly Summary called asking for clarification of a figure published in Article 3 on page 6 of issue 97-14. Also, the search criteria associated with the figure contained typographical errors. This prevented readers from reproducing the data used for the figure. Operating Experience and Feedback (OEAF) engineers decided that a clarification of the figure was needed.

The figure shows the performance of each DOE Operations Office on two scales: (1) the rate of exposure to electrical hazards and (2) the rate of electrical shocks and injuries. Each DOE Operations Office is identified by a point, except LANL, which is identified separately from the other Albuquerque Operations Office sites. OEAF engineers determined each of the rates by performing an ORPS search,¹ reading all of the reports found, and classifying the reports as applicable or inapplicable.

For electrical hazards, we considered the report applicable if there was a reasonable chance that an individual could have come into contact with an energized connector or could have been injured by an electric arc or electrical fire. For electrical shocks and injuries, we considered the report applicable if a shock or injury occurred. OEAF engineers determined that 237 of 284 reports met the electrical hazard criteria; 73 of 113 reports met the criteria for electrical shocks and injuries.

The purpose of the figure was to show the strong relationship between exposures to electrical hazards and electrical shocks and injuries. Thus, electrical hazard exposures can be considered a precursor to shocks and injuries, and actions taken to reduce exposures to electrical hazards will also reduce shocks and injuries. This type of relationship does not apply to all potential precursor relationships. For instance, OEAF engineers created a similar graph showing falls that caused injuries and fall protection violations. That graph seems to indicate that some sites are more stringent about reporting fall protection violations. It does not, however, indicate that a precursor relationship exists. Readers are cautioned against reaching a conclusion based solely upon the position of a point on the graph. In general, the position of the point representing a site on these graphs depends on both the safety practices and the reporting standards at the site, and a conclusion can be reached only after reviewing all of the reports.

¹The correct search criteria used for exposure to electrical hazards were as follows. Narrative search on description of occurrence, "shoc@+short@+electrocu@+burn@ +expos@+energiz@+spark@+fire@+dang@+locko@," nature of occurrence code, "+3A, -1G," narrative search on subject or title, "electric@+volt@+kv@+(power lin@+condu@)+recepti@, -suspect@, -prevent@, -los@," discovery date 01/01/94 to 12/31/96. For electrical shocks and injuries, the correct search criteria were as follows. Narrative search on description of occurrence, "shoc@+electrocu@+burn@," nature of occurrence code, "+3A, -1G," narrative search on subject or title, "electric@+volt@ +kv@+(power lin@+condu@)+recepti@, -suspect@, -prevent@, -los@," discovery date 01/01/94 to 12/31/96.